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The costs of turnover in nursing homes

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Abstract

Background—Turnover rates in nursing homes have been persistently high for decades, ranging upwards of 100%.

Objectives—To estimate the net costs associated with turnover of direct care staff in nursing homes.

Data and sample—902 nursing homes in California in 2005. Data included Medicaid cost reports, the Minimum Data Set (MDS), Medicare enrollment files, Census and Area Resource File (ARF).

Research Design—We estimated total cost functions, which included in addition to exogenous outputs and wages, the facility turnover rate. Instrumental variable (IV) limited information maximum likelihood techniques were used for estimation to deal with the endogeneity of turnover and costs.

Results—The cost functions exhibited the expected behavior, with initially increasing and then decreasing returns to scale. The ordinary least square estimate did not show a significant association between costs and turnover. The IV estimate of turnover costs was negative and significant ($p=0.039$). The marginal cost savings associated with a 10 percentage point increase in turnover for an average facility was \$167,063 or 2.9% of annual total costs.

Conclusion—The net savings associated with turnover offer an explanation for the persistence of this phenomenon over the last decades, despite the many policy initiatives to reduce it. Future policy efforts need to recognize the complex relationship between turnover and costs.

Keywords

turnover; nursing homes; cost functions; instrumental variables

Introduction

High rates of staff turnover in nursing homes is not a recent phenomenon.¹ As far back as the mid 1970s studies have documented average turnover rates for registered nurses (RNs), licensed vocational nurses (LVNs) and certified nurses aides (CNAs) ranging between 55% and 75%.² Rates have remained high throughout the decades, often exceeding 100% for CNAs,^{3, 4} the most common type of care giver in nursing homes. These high rates have persisted despite the large number of studies documenting an association with poor quality of care,^{5, 6} and an ongoing concern among scholars and policy makers about the level of turnover in nursing homes, as well as recent policy initiatives in many states that are aimed at lowering turnover rates.^{4, 7}

While it is important to recognize that low levels of turnover may actually be beneficial as they reflect the adjustment of an organization to its workforce and vice versa, ensuring that those who remain employed are suited to the job and the work environment,⁸ high turnover rates of 50% and 100% as experienced in most nursing homes are likely to be disruptive. A large number of studies have investigated the factors contributing to this phenomenon, examining characteristics of the worker, the nursing home and the environment. Their findings vary, depending on the sample and the time frame. For-profit^{9, 10} and chain affiliated⁸ facilities were found to have higher turnover rates compared with non-profit and free standing facilities respectively. Some studies have shown that lower staffing levels, increased work burden and higher bed size are associated with higher turnover,^{7, 9–14} while other studies did not find similar associations.^{8, 9, 15, 16} Low wages and benefits have been found to contribute to turnover,^{14, 15} although a more recent study of the California initiative designed to increase wages in nursing homes was not successful in decreasing turnover.¹⁷ An organizational climate that fosters communications and team work and rewards employees was also associated with lower turnover in some studies,^{10, 12} but not in others.⁸ Other studies have identified the importance of good supervision for improving intent to stay as well as the hiring of a trained retention specialist.^{18, 19} An association has also been found between higher market unemployment levels and lower turnover rates.¹³ The large number of factors associated with turnover on the one hand, and the inconsistency in findings across studies on the other, suggest that turnover is a complex phenomenon, which may not be easily amenable to policy interventions.

The one area not studied systematically to date is the costs of turnover. Most scholars assume that turnover is costly.^{2, 9, 15, 20, 21} Caudill and Patrick²² in a 1991 study estimated the costs of replacing a CNA at around \$2,000 and an RN at around \$7,000. These estimates, however, are only the direct replacement costs associated with turnover. Turnover is likely to also have indirect cost implications, discussed further in the conceptual framework section below.

The study we present here is designed to estimate the net costs associated with turnover of direct care staff in nursing homes. We estimate total costs as a function of wages and outputs augmented with turnover rates and use instrumental variable techniques to deal with potential endogeneity between turnover and costs. This specification allows us to estimate the overall, net effect of turnover on cost, and evaluate whether turnover is associated with net cost savings or not.

Conceptual Framework

Excessive staff turnover is considered detrimental to efficient organizational operation and hence costly.⁸ Turnover requires hiring replacement staff, which entails recruitment costs, ranging from advertisement, to payment to employment agencies, to the costs of human resources personnel engaged in interviews and the hiring processes. Newly hired personnel require training in the facility's policies and work procedures. The more turnover, the more training the facility has to provide, and the higher the training costs it incurs. Furthermore, the more turnover, the larger the proportion of the facility's workforce that is made of new workers who are less familiar with the facility's policies and procedures, and might, therefore, be less efficient and less productive.^{23, 24} High turnover rates may also result in longer periods of understaffing, if the nursing home is unable to fill vacant positions. "Short" staffing conditions require existing staff to work overtime, which is more expensive. Thus, high turnover rates increase costs, some of which are easily identified and traced to new hiring, and some which are not easily accounted for.

Turnover may also be associated with higher costs because it may lead to lower quality of care. An inexperienced staff may not be able to care for the residents in ways that would maintain their health as much as a more experienced staff would. Furthermore, high turnover rates could be detrimental to residents' mental health and well being because continuity of care and personal relationships with the staff which tend to be important for this population, are disrupted.^{3, 25} Having an overall sicker resident population in the nursing home increases costs, as they require more care. Thus the impact of turnover on quality may lead to increased costs of care as well.

While these considerations lead us to expect that turnover will be associated with higher costs, there are other considerations which suggest the opposite. There are several management practices which lead to lower costs and which are also likely to lead to higher turnover. These practices include maintaining low staffing levels, keeping salaries and benefits low, avoiding salary increases,²⁶ forgoing investment in personnel such as training, staff rewards, team building, and any other activities that would increase retention by making the work environment more attractive to staff, as well as limiting investment in the physical environment, i.e. equipment and supplies. All these strategies enable a facility to operate at lower costs, but they also increase the burden on staff, make the work environment less attractive and hospitable, and are, therefore, likely to increase the propensity of staff to leave, thus leading to an association between lower costs and higher turnover. Such management strategies, of cost-minimization with a high staff turnover rate, have been observed in other industries, such as the fast-food sector.²⁷ The fast-food industry tends to hire low-skilled workers, it keeps training costs low, as it relies on a generally available large supply of workers to fill new positions. The nursing home sector may be similar, although these practice decisions are likely to be more complex and heterogeneous in this sector, as Borjas et al.²⁸ suggest, because of the heterogeneity of both ownership types and the financial incentive due to different state reimbursement systems.

Because turnover may be associated with activities that both increase and decrease costs, it is impossible *a priori* to determine if turnover is associated with net savings or net expenses. The fact that turnover has been a persistent phenomenon over many decades suggests that there are business or cost advantages to turnover not previously acknowledged in the literature. Otherwise, rational nursing home managers would have adopted management strategies that would have minimized costly turnover.

Methods

Sample and data

The study included all skilled nursing facilities in California in 2005. We chose 2005 because it was the most recent year for which state audited turnover data were available. We obtained Medicaid cost report from the California Office of Statewide Health Planning and Development (OSHPD). These are annual financial reports that are mandated by the state and the information is collected according to specific accounting rules. The submitted data are audited by the state. Data that does not meet the audit screen are returned to the facility for correction. These data are used to set Medicaid payment rates for all nursing homes in the state. Thus nursing homes have an incentive to ensure their accuracy. These reports include information about expenditures, wages, outputs (e.g. inpatients days, and admissions) and turnover rates.

The 2005 Minimum Data Set (MDS) was used to calculate a Nursing Case Mix Index (NCMI) for each nursing home. The MDS is an individual level data set with information about all residents in the facility, with demographic information, physical and mental health status, and information about specific treatments. MDS data are collected by nursing homes upon admission and at specific time intervals following admission (e.g. every 90 days for long-term care patients). Data collection is mandated by the Centers for Medicare and Medicaid Services (CMS). MDS data are used by CMS to determine Medicare payment to the facility and the quality measures reported in the Nursing Home Compare, a web based public quality report card for nursing homes. The validity of the MDS and the inter-rater reliability has been reported previously.^{29–31} MDS data, merged with Medicare enrollment files for the period 2001–2003, were used to construct nursing home markets and to calculate competition indices.

Instrumental variable (IV) data for turnover were obtained from the 2002 Economic Census, Sector 62 – “Health Care and Social Assistance” by receipt/revenue size of establishment and by zip code, and from the Area Resource File (ARF).

There were 1107 skilled nursing facilities with cost reports in California in 2005. 144 were excluded from the analysis because of missing case mix data; 38 were excluded because of missing data for other variables in the cost reports and 23 were excluded because of missing IV data. The final sample included 902 nursing facilities.

Variables

The dependent variable was annual total costs defined as total facility’s expenditures. The independent variable of interest was turnover of direct care staff, defined in the cost report as the number of people employed during the year divided by the average number of employees minus 1 (and multiplied by 100 to be expressed as percent). It was calculated for all employees providing direct nursing care: registered nurses, licensed vocational nurses, certified nurses’ assistants, technicians, specialists and others.

Outputs included case mix adjusted nursing home inpatient days and case mix adjusted nursing home admissions. Because some nursing homes produce other services in addition to inpatient days, such as home care, outpatient clinics or day care visits, inpatient days were adjusted upwards by the ratio of outpatient to inpatient revenues to account for the higher output level in facilities producing these services.

Facility-level case mix data were calculated using the 2005 MDS data. For each facility, the average Nursing Case Mix Index (NCMI) was calculated by applying the Resource Utilization Groups version III (RUG-III) resident classification system currently used by CMS to adjust Medicare payments in recognition of resident acuity. This system classifies residents into homogeneous categories based on their estimated resource utilization. Associated with each

of these categories is a case-mix index or weight, which approximates the relative staff time associated with caring for the average resident in each group.³² Thus, the higher the NCMI score, the more severe the average acuity profile of the residents in a facility. We calculated two versions of the NCMI, as the average over all resident-level NCMI values, based on all admission assessments (representing mostly the post-acute, short-stay population) and all annual assessments (approximating the long-stay population), in each facility. The resident-level NCMI was calculated in two steps. First, the RUG-III 5.12 code (44 categories in total) was used to generate a RUG classification for each resident. Second, the RUG code was converted into a NCMI value following the CMS proposed rule regarding fiscal year 2004 Skilled Nursing Facility (SNF) payment policies.³³ The annual case mix index was interacted with adjusted inpatient days and the admission case mix index was interacted with admissions.

Competition was calculated based on patient migration patterns, following Zwanziger et al.³⁴ Medicare enrollment files were used to identify the zip code of residence for nursing homes residents in the year prior to their nursing home admission. This information about patient flows was then used to identify which zip codes comprise the markets for each nursing home and which nursing homes compete in each market. Zip codes that contribute up to 70% of admissions to the nursing home were considered to be in its core market. We then calculated the Herfindahl-Hirschman Index (HHI) for each facility as a weighted average for all the zip code markets in which it participates. For ease of interpretation we included in the analysis a variable measuring competition and defined as 1-HHI, such that higher values indicate more competitive markets.

We defined two instrumental variables for turnover. Both are measures of alternative opportunities in the local labor market and are, therefore, likely to be correlated with staff propensity to turnover but are not likely to be directly associated with the facility's costs, the properties required for an appropriate IV. The first was the number of registered nurses in the county per 1000 population, from the ARF. It was previously shown to be correlated with RN turnover in nursing homes.³⁵ The second was the weighted number of establishments for health care and social assistance in the zip code in which the nursing home is located, as reported in

the Economic Census data. This variable was calculated as $IV = \sum_i w_i N_i$ where N_i is the number of establishments in revenue stratum i , and the weights, w_i , is the middle point of the annual revenue range for the revenue stratum (except for the last category), as follows:

$$w_i = \begin{cases} 50 & \text{if } \text{revenues} < \$100,000 \\ 175 & \text{if } \$100,000 \leq \text{revenues} \leq \$249,999 \\ 375 & \text{if } \$250,000 \leq \text{revenues} \leq \$499,999 \\ 750 & \text{if } \$500,000 \leq \text{revenues} \leq \$999,999 \\ 1000 & \text{if } \text{revenues} \geq \$1,000,000 \end{cases}$$

Methods

We estimated a hybrid cost function following Nyman³⁶ and Mukamel et al.³⁷ as follows:

$$\log C = \phi X + \alpha \log W + \sum_{i=1}^3 \beta_i (D \times \text{DCMI})^i + \sum_{i=1}^3 \gamma_i (\text{ADM} \times \text{ACMI})^i + \delta \text{TO} + u$$

where C is annual total costs, W is the county average CNA wage, $D \times \text{DCMI}$ and $\text{ADM} \times \text{ACMI}$ are case mix adjusted inpatient days and admissions respectively, and TO is percent turnover of direct care nursing staff. X is a vector of other exogenous facility and environmental

characteristics that have been shown to shift nursing home cost functions in previous studies - ownership, competition.³⁷

The model included higher order terms of inpatient days and admissions, to allow for both economies and diseconomies of scale.³⁸ Because turnover might be endogenous with costs, as decisions that affect costs may also affect turnover, in addition to estimating the cost function using Ordinary Least Squares (OLS) techniques, we also estimated it using Instrumental Variables (IV) Limited Information Maximum Likelihood (LIML) regression with the IVs described above. We present the results of both estimates.

All analyses were conducted using Stata, version 10.0 (StataCorp LP, College Station, TX, USA).

Results

Table 1 presents descriptive statistics for the study sample. In 2005, the average nursing home in California had 100 beds, annual total costs of \$5.76 million with over 32,000 adjusted patient days and over 250 admissions. Turnover of direct care staff was high, averaging 62% and highly variable, with a standard deviation of 40%. The facilities excluded from the analyses due to missing data tended to be smaller, with significantly lower (at the 0.05 level) numbers of beds, costs, days and admissions. However, they were not significantly different from the study sample in terms of turnover rates, wages or the level of competition in their market.

Table 2 shows the first stage instrumental variable equation. The dependent variable is the turnover rate. The independent variables include all the exogenous variables included in the cost model and the two IVs, i.e. the weighted number of health and social services establishments in the zip code and the number of RNs per 1000 population in the county. Both IVs are highly significant, with p values of 0.009 and 0.005 respectively, indicating a high correlation with the turnover variable. The incremental $F_{(2,889)}$ was 7.36, which is below 10, the value typically suggested as the cutoff for a strong IV for two stage least square estimators.³⁹ This rule of thumb is reasonable in the context of relative bias of the two stage least square estimator, because the 5% critical value for a weak instrument and a relative bias of 10% is 9.08 for 3 IVs and it increases to about 11 as the number of IVs increases.⁴⁰ (It is not available for less than 3 IVs). However, Stock et al.^{40, 41} have shown that when using limited information maximum likelihood rather than two stage least squares, and when the criteria for weak instruments is based on inference rather than relative bias, the critical F for rejection of the hypothesis of weak instruments declines with the number of instruments. The critical value of the F statistic for the weak instrument test that the size of the 5% Wald test can exceed 15% is 5.33. The incremental $F_{(2,890)}$ of 7.36 that we estimated exceeds this critical value. We, therefore, reject the null hypothesis of weak instruments. Of the other exogenous variables, nurses' aides wages were negatively associated with turnover and case mix adjusted admissions and for-profit ownership were positively associated with turnover.

Table 3 shows the estimates of the cost functions. The first column shows the ordinary least square (OLS) estimate. The second column presents the IV estimate. The two cost functions are very similar except for the turnover estimates. Both show the typical relationship between outputs, case mix adjusted days and admissions and costs, with a highly significant positive linear term, negative squared term and positive cubed term, indicating increasing and then decreasing returns to scale. As expected, costs also increase with wages. For profit nursing homes and those in more competitive areas have lower costs as has been found in previous studies.³⁷

The turnover coefficient in the OLS model is very small, -0.025, and not statistically significant, with a p value of 0.093. The IV estimate is larger, -0.289, and statistically

significant, with a p value of 0.039. The overidentification restriction test statistics, both the Anderson-Rubin χ^2 ($\chi^2=0.96$, $p=0.328$) and the Basman's F ($F_{(1,891)}=0.946$, $p=0.331$), were not significantly different from zero. This indicates that the IVs are not correlated with the error terms of the structural cost equation.

Based on the results of the IV model, the marginal cost of turnover, i.e. the decrease in costs due to an increase of one percentage point in turnover, for the average facility, is $-\$16,706$, or -0.29% of the annual total cost of $\$5.76$ million.

Discussion

Staff turnover in nursing homes has been studied for many decades, with researchers focusing on the organizational and staff characteristics contributing to it and its impact on quality of care. It has been assumed by most that it is also costly. This study is the first, to our knowledge, to show that the association between turnover and costs is negative; i.e. on net, turnover is associated with cost savings. Our ability to detect this relationship is due to two factors: we estimated the net relationship between turnover and costs, accounting for both direct and indirect costs, and we employed instrumental variables techniques to address the potential endogeneity between costs and turnover.

One should not be surprised by this finding. If turnover were on net costly, rational nursing home managers would have identified and at least attempted to implement strategies to eliminate it, because by doing so they would have saved money (and possibly improved quality). In the long run, rational economic agents are expected to operate at the minimum of their cost curve, and any practice that deviates from it will not be sustained. The fact that turnover has persisted for decades is an indication that for the majority of nursing homes it is part of their cost minimizing strategy. Our finding only confirms this.

Furthermore, we find that the net cost impact of turnover is not negligible. An increase in turnover of ten percentage points, e.g. from 50% to 60%, is associated with a 2.9% cost savings, close to $\$170,000$ annually for an average facility. A nursing home choosing between operating at the 25th percentile versus the 75th percentile of turnover, i.e. between 38% and 78%, would experience a cost saving of $\$668,252$ ceteris paribus.

We should note several limitations of this study. First, it is possible that the relationship between costs and turnover is not linear, and that the negative marginal costs decline and eventually, at high turnover rates, taper off and perhaps even turn positive. Unfortunately, we were unable to estimate a nonlinear relationship between turnover and costs with the IV estimation procedure and the data available to us. However, the large number of nursing homes exhibiting high rates of turnover over many years suggests, as we discuss above, that this is a long term equilibrium phenomenon which is consistent with a negative relationship to costs. This study was also limited to California nursing homes. Results may not generalize to other states that have other payment systems and other programs directed towards turnover.²⁸ However, again we note the fact that turnover is wide spread throughout the country and has persisted overtime in other states as well. Another limitation is directly related to our methodology. Our approach yields an estimate of the overall net costs associated with turnover, and as such accounts for both the direct and indirect costs associated with it. The advantage of this method is that it offers a comprehensive assessment of the cost impact of turnover, and we believe that it is this that allows identification of the cost savings associated with turnover. The limitation, however, is that it does not offer any insights into the individual components that make up the total cost savings and cannot provide any direct policy guidance.

Our findings raise two questions. First, are high turnover rates indeed detrimental to quality of care and hence should they be the target of policies aimed at decreasing them? And, second,

assuming that the answer to the first question is in the affirmative, given our findings about the costs to nursing homes that are associated with turnover, what policies are likely to be successful in reducing turnover rates?

Addressing the first question is outside the scope of this paper. Further research that investigates the causal relationship between quality of care, resident health outcomes and quality of life, and turnover rates is needed. And while research to date has shown an association between high turnover and poor quality,^{6, 20, 42–44} to our knowledge there are no studies that have examined these issues accounting for the potential endogeneity between quality and turnover. Hence the causal relationship between turnover and quality of care is unknown.

The answer to the second question, namely which policies are likely to be effective in reducing turnover rates, depends on the magnitude of the net cost impact of turnover. Our finding suggests that such policies have to have a substantial impact on cost. For example, if one were to consider the use of turnover statistics as a quality measure to be included in report cards, such as the CMS Nursing Home Compare, such a policy is likely to be effective only if its impact as a deterrent to demand can be expected to be substantial. However, experience to date with consumers' response to Nursing Home Compare⁴⁵ and nursing homes actions in response to reported low quality scores⁴⁶ suggest that the impact of public quality reporting in shaping demand is small. Similarly, experience to date with state reimbursement programs that target payment for staffing has not yielded much. Zinn¹⁴ reports that in Michigan, by 2003, turnover has decreased only from 75% to 68% since the implementation of a wage pass-through in 1990, and in Kansas it decreased from 120% to 116% since a 1998 implementation of a wage pass-through. Schnelle et al.,¹⁷ in a more recent study, found that a California experiment with a reimbursement system increasing staffing wages, benefits and other retention enhancing initiatives was actually associated with an increase in turnover. The General Accounting Office⁴ reported that in 1999 30 states were addressing nurses' aides recruitment and retention through task forces, initiatives and research. A survey by the Iowa Legislative Fiscal Bureau in the same year identified 6 states with pass-through initiatives.⁷ Despite these efforts, high turnover rates persist.

Our findings suggest that current policy initiatives may be insufficient in magnitude to incentivize nursing homes to address the issue, given the financial implications of turnover. Future policy efforts need to recognize the complex relationship between turnover and costs and take it into account when designing incentives to decrease it.

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Table 1

Descriptive Statistics (N=902)

Variable	Mean	Standard Deviation	Minimum	Maximum
Total annual costs (\$)	5,760,807	3,063,688	1,089,115	22,039,150
Adjusted patient days *	32,168	15,677	4,475	136,345
Admissions	258	277	0	4290
Annual case mix index	0.74	0.08	0.48	1.37
Admission case mix index	1.00	0.13	0.54	1.45
Log of county average CNA wages	2.38	0.13	2.06	2.65
Competition (1-HHI)	0.82	0.12	0.00	0.96
Revenue weighted number of health and social services establishments in the zip code	30.4	22.1	0.2	13.8
RNs per 1000 population in the county	10.5	4.8	0.0	33.7
For profit organization	0.87	0.34	0.0	1.0
Turnover - direct care nursing (%)	62.0	40.0	0.0 **	352.9

$$*\text{adjusted patient days} = \text{total patient days} \times \left(1 + \frac{\text{outpatient revenue}}{\text{inpatient revenue}} \right)$$

** 19 nursing homes had turnover rate of zero.

Table 2

Instrumental variable equation: Dependent variable = direct care nursing turnover

Independent variables	Coefficient	P value
IV: weighted # of establishments in the zip code *	-1.63×10^{-3}	0.009
IV: RNs per 1000 population in the county *	8.04×10^{-3}	0.005
Case mix weighted patient days	-0.126	0.090
Squared case mix weighted days	0.010	0.604
Cubed case mix weighted days	-2.76×10^{-4}	0.850
Case mix weighted admissions	0.498	0.001
Squared case mix weighted admissions	-0.306	0.034
Cubed case mix weighted admissions	0.044	0.094
Log county CNA wages	-0.445	0.000
For profit organization	0.189	0.000
Competition	0.016	0.885
Constant	1.601	0.000

N=902; $R^2=0.08$ * The F test for the IVs $F(2,890)=7.356$

Table 3

Comparison of Ordinary Least Squares (OLS) and Instrumental Variable (IV) Limited Information Maximum Likelihood (LIML) Estimation of Log Total Costs (p-values in parentheses)

Independent Variables	OLS	IV LIML
Turnover	-0.025 (0.093)	–
Predicted turnover	–	-0.289 (0.039)
Case mix weighted days	0.823 (0.000)	0.789 (0.000)
Squared case mix weighted days	-0.110 (0.000)	-0.108 (0.000)
Cubed case mix weighted days	0.005 (0.000)	0.005 (0.000)
Case mix weighted admissions	0.760 (0.000)	0.889 (0.000)
Squared case mix weighted admissions	-0.315 (0.000)	-0.393 (0.000)
Cubed case mix weighted admissions	0.042 (0.000)	0.052 (0.000)
Log county average CNA wages	0.655 (0.000)	0.549 (0.000)
For profit organization	-0.122 (0.000)	-0.072 (0.032)
Competition	-0.100 (0.040)	-0.117 (0.040)
Constant	12.595 (0.000)	13.020 (0.000)
	N=902; R ² =0.89	N=902; R ² =0.85